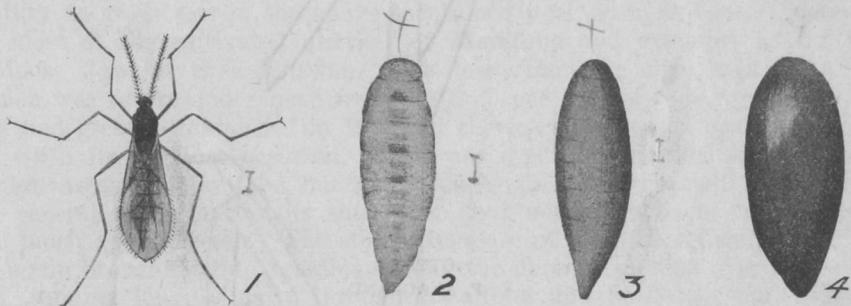


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THE HESSIAN-FLY IN THE PRAIRIE PROVINCES

By NORMAN CRIDDLE
Entomologist in charge for Manitoba



The Hessian-fly, *Phytophaga destructor* Say. 1, adult female fly; 2, mature larva; 3, puparium or "flax-seed"; 4, seed of cultivated flax for comparison—enlarged about 8 times.

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THE HESSIAN-FLY IN THE PRAIRIE PROVINCES

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INTRODUCTION

The Hessian-fly, *Phytophaga destructor* Say, is not a native of the Prairie Provinces; it made its way into the country many years ago, either by being introduced in straw or by a gradual movement from its original place of introduction in the United States. Having once found its way into our territory, it readily established itself and by the year 1899 had increased sufficiently to become a menace to grain crops. As a matter of fact, the first record we have of injury to grain was in the above mentioned year when the insect appeared over most of the cultivated districts of Manitoba and extended as far west as Moose Jaw in Saskatchewan. The loss from the fly's attack on this occasion was severe and ranged from 10 to 30 per cent of the crop. This outbreak had greatly diminished in 1900 but the insect increased again two years later when further loss occurred, which was especially marked in the middle northern areas of Manitoba but much less so in Saskatchewan. There have been several minor outbreaks since then, but not of sufficient magnitude to cause much apprehension. The steady increase of the insect during 1921 and 1922 again brought it into prominence and the damage in 1922 over the middle areas, running longitudinally through Manitoba and Saskatchewan, indicates the desirability of stating briefly the best measures for control for this insect under prairie conditions.

DESCRIPTION

The adult hessian-fly is a gnat-like insect resembling a minute mosquito. It is dusky in appearance with a reddish abdomen which is particularly noticeable in the female fly.

The egg is very small, elongate in shape, and bright red in colour. It is usually placed on the upper side of the grain leaves and generally along the grooves or creases. Several eggs may be deposited on a single leaf.

The larva or maggot is red at first but later, after moulting, becomes whitish or semi-transparent.

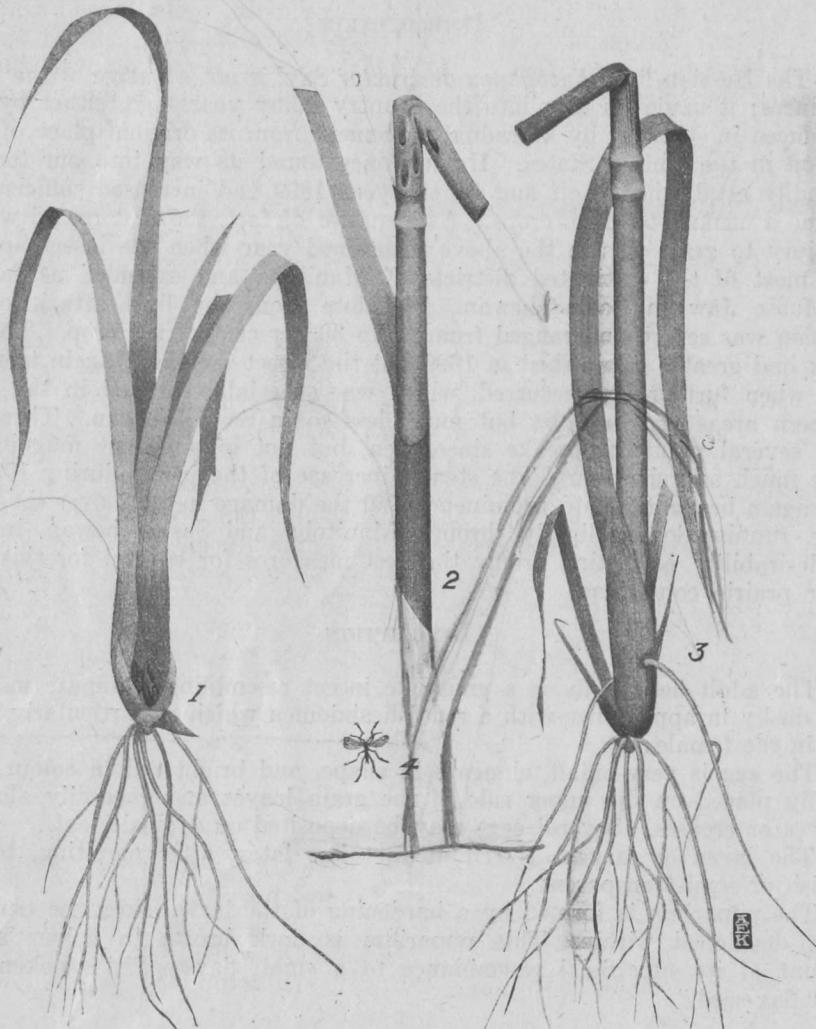
The puparium is formed by a hardening of the larval skin, the true pupa being developed within. This puparium is dark brown in colour and on account of its superficial resemblance to a small flax-seed, is spoken of as the "flax-seed".

LIFE-HISTORY

There are two generations of the hessian-fly on the prairies, the first being a full one, and the second a partial one. Flies of the first generation emerge from overwintering puparia in May. Those of the second generation appear in early July. The second, or summer generation, however, is not a full one as only a certain percentage of the "flax-seeds" formed in the spring give rise to flies in July, the remainder continuing as puparia until the following May when they develop into adults in company with those flax-seeds formed in late summer.

The following summary gives the general life-history of the hessian-fly so far as it is known on the prairies at the present time.

Adult flies emerge from the stubble about the second week in May, make their way to the new crop and within a few days the females are busily engaged depositing eggs upon the upper side of the leaves, the eggs being placed along the grooves or creases. Several eggs may be placed on a single leaf and each female lays about 160 eggs.



Showing typical injury by the Hessian-fly, *Phytophaga destructor*; 1, spring wheat plant destroyed in early June with puparia or "flax-seeds" showing near roots; 2, part of a wheat stem in late July with sheath removed showing "flax-seeds" above the joint; 3, characteristic bending of the stem caused by larvæ of the summer generation; 4, adult fly. All natural size. (Author's illustration.)

The eggs hatch within a few days of being deposited, and the resulting larvæ or maggots immediately make their way down the leaf creases until they reach the base of the plant where they remain throughout their life. The attack at this time may be recognized by a sickly and general stunted appearance of the plant; the middle shoot is often killed and frequently the entire plant may be destroyed, or so severely injured as to never recover sufficiently to develop a stem. A field so infested shows a patchy condition, there being

gaps in the rows which, as a rule, are particularly noticeable in the lower or rougher portions of the field. Pupation takes place in mid-June thus ending the spring attack.

Flies from the June developed flax-seeds appear in early July though, as pointed out above, some of the puparia do not produce flies until the following year. The flies appearing in July quickly deposit their eggs upon the plants amid which they emerge, the eggs generally being placed upon the leaves formed directly above the first or lowest of the three main joints around which the larvæ cluster. The result of this attack just above the joint is that the stem becomes very much weakened at that point causing it to fall over thus producing the characteristic bent straws. A stem broken over in this manner just above a joint should always be looked upon with suspicion. If it be hessian-fly work an examination will reveal the puparia or "flax-seeds" embedded in the straw near the break. It should be pointed out, however, that while the position of attack is usually above the first joint it is not necessarily so, a higher joint being frequently selected or even a place close to the ground. The bending of the stems begins to be noticeable in late July but is more pronounced in August.

PLANTS ATTACKED

Hessian-fly infestation is confined to members of the grass family, of which a limited number of kinds prove suitable to the development of the insect. Of cultivated grains, wheat, barley and rye suffer most, the first two being much more frequently infested. In addition to these plants the flies have been known to lay their eggs in some numbers upon oats, though the larvæ seldom survive in this plant and the injury inflicted upon it is insignificant. Western rye-grass (*Agropyron tenerum*), bearded rye-grass (*A. richardsoni*), couch grass (*A. repens*) and lyme grass (*Elymus spp.*) of various kinds are all subject to infestation and the insect develops in them without apparent difficulty. We have so far failed to find any other grasses attacked on the prairies though a more careful search may reveal several.

REMEDIES

In order to apply the most effective remedies it is necessary to keep in mind the following facts:—

1. A majority of the puparia or "flax-seeds" are in the stubble from August to May of the following year.
2. All "flax-seeds" above the first joint will be taken up by the binder in harvesting and a great number of these will fall into the screenings when the grain is threshed, the remainder going into the grain or straw piles.
3. That the "flax-seeds" from the spring generation are usually slightly below the ground at the base of the plants.
4. That the "flax-seeds" from the summer generation are nearly always above the ground in the stubble.
5. That there is no practical method of destroying the insects when they are among the crops.
6. That the adults readily fly from last year's stubble to the new crop, even though it be some distance away.

The following recommendations are based upon the above facts:—

1. Burn all infested stubble between August and May 10 of the following year. This will destroy all the "flax-seeds" present above ground.
2. Plough all infested fields deeply between August and May 10. By this practice the flies will be prevented from emerging from the "flax-seeds" present below ground and from such others that could not be burned above ground.
3. Feed, crush or destroy all screenings between the above mentioned dates to kill the "flax-seeds" present.
4. Plough land intended for summer fallow before the end of June. This will destroy all volunteer plants that may be infested.
5. Sow immune crops such as oats or flax. Apparently winter rye is also free from serious injury but we have not had sufficient opportunity of deciding this.
6. Cut the crops high in order that the stubble may burn better.

WEATHER FACTORS

It is noteworthy that the hessian-fly usually multiplies most quickly in wet years and that its greatest increase appears to coincide with the areas of most rainfall. Thus, good crop years are more apt to be accompanied by hessian-fly outbreaks than are dry ones, and districts averaging a greater precipitation are most likely to have hessian-fly outbreaks than others less favorably supplied with moisture.

PARASITES

The fact that hessian-fly outbreaks are periodic instead of continuous is very largely due to parasites which infest these insects. These parasites are always present but they occasionally become so much reduced as to be of little importance, and at such times the hessian-fly, being unmolested, is able to increase very quickly, always providing moisture conditions are satisfactory. Should these two conditions arise we might then have an outbreak of the insect perhaps covering several years. Eventually, however, the parasites would develop sufficiently to overcome their hosts and the fly would then diminish into insignificance. It is on account of these parasites, combined with weather factors, that our hessian-fly outbreaks are few and far between and though it is unwise for the farmer to rely upon such allies it is, nevertheless, of satisfaction to know that they are present and that they will eventually come to his aid.

GENERAL NOTES

The presence of wheat-stem sawfly over a large portion of the prairie provinces has caused some people to confuse this insect with hessian-fly. The following points of difference should enable anyone to separate the two insects.

(1) The hessian-fly larvæ cluster above a joint or near the base of the plant and they are found on the *outside* of a stem. They do not tunnel the joints. The sawfly larvæ, on the other hand, are only found *within* the stem and they eventually tunnel through all the joints, ultimately cutting the stem level with the ground. The dust-like borings will always separate the work of the sawfly from that of hessian-fly. (2) The hessian-fly is a very small two winged insect, while the sawfly is much larger and has *four* wings.

Since both the hessian-fly and wheat-stem sawfly are to be found in the stubble from August to May, it is frequently possible to destroy both at once by deep, well turned, ploughing. The sawfly, however, can readily make its way through loose ploughing and for that reason spring ploughing should be packed. The use of a skimmer is to be recommended in order to insure all the stubble being turned in.*

It is advisable here to emphasize the desirability of co-operation among farmers in combating hessian-fly and sawfly outbreaks. Both these insects readily fly from one farm to another and, therefore, unless neighbours combine in their control efforts there is sure to be infestation from neglected fields to those where remedial measures have been practised.

* See Pamphlet No. 6, New Series, Entomological Branch, Dominion Department of Agriculture, for information on the wheat-stem sawfly.

